Space Weather Forecast

Issued on Friday, 30 June 2023 at 13:07 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Daily Chance of Minor/Moderate R1/R2 Radio Blackouts. Chance of Minor G1 Geomagnetic Storm intervals, peaking 01 July.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with X-ray activity showing occasional Common-class flares, but with a peak mid-ranking Moderate-class at 29/1415UTC from the largest and most magnetically complex sunspot group near the middle of the facing side. This group has shown some spreading in the period, with a tendency for a slight overall decrease in area, although it remains nominally potent. This was one of up to six sunspot regions on the Earth-facing side of the Sun into the current UTC morning, with a previous encumbent now no longer discernible on the northwestern solar horizon, while the remainder of groups were all stable and (apparently) magnetically unipolar.

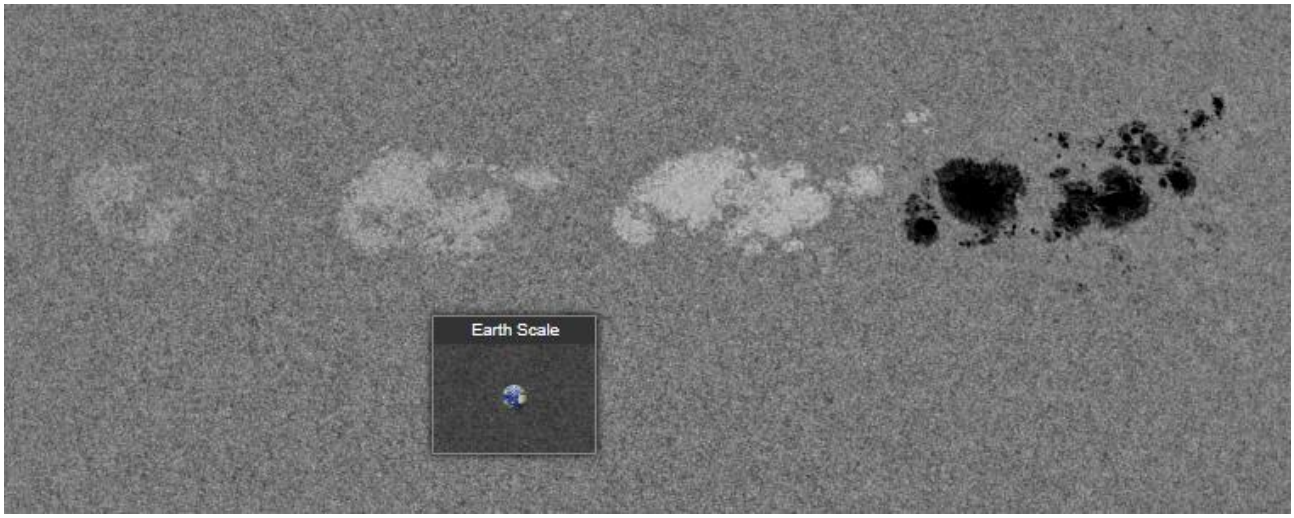

Figure 1: Increase in the area of the largest sunspot over the course of the past three days, shown as a running difference of visible satellite imagery. The latest appearance of the group is shown in black on the far right (30/1130UTC); previous incarnations in stages left of this, with the letmost 27/1130UTC. Image processing courtesy of Helioviewer.org.

The Moderate-class flare from the largest sunspot produced ejecta that was subsequently seen heading largely north of the Sun-Earth line through the UTC overnight period. This feature has been analysed and determined to carry a possible Earth-directed component - crossing the radius of the Earth's orbit within the UTC day of Tuesday 04 July, with a marginal glancing blow of Earth. Also of note was a large but far-sided 'prominence eruption' (arc of plasma on the Sun's edge), with this seen heading north and away to the east on imagery, to no effect at Earth.

Solar Wind / Geomagnetic Activity: The solar wind implies a possible weak fast wind may be in

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course, perhaps most likely that from a 'coronal hole' in the southwest quadrant from 30/0130UTC.

The solar wind speed accordingly rose over the 24 hours from slightly elevated to elevated levels. There were several discontinuities observed in this trace, most notably with the commencement of the fast wind from 30/0130UTC. The number of particles comprising the solar wind showed a gradual ramping within Background levels, subsequently falling away as the fast wind ensued. The associated magnetic field was modest throughout, with the north-south component varying between mainly anti-aligned (with Earth's field), to a more variable behaviour into the current UTC day (the latter to lesser effect).

The net effect of the above solar wind measures was for mainly quiet geomagnetic activity, initially just below Minor Storm G1 and falling with time.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a daily chance of returning to Moderate, with a slight chance of Strong-class flares. This risk is almost entirely from the largest sunspot group at first, but may be bolstered by returning regions into the new week.

Solar Wind / Geomagnetic Activity: A CME which left the northeast quadrant of the Sun on 27 June may glance the Earth early on 01 July, but this is low confidence. A newly-analysed 29/1415UTC Moderate-class flare-related CME from the large central sunspot may affect Earth as a glancing blow on Tuesday 04 July, i.e. outside the scope of the current forecast but with a suggested Slight Chance of Minor Geomagnetic Storm G1 arising.

In the absence of CME activity, the current fast wind is likely to be the only one in the forecast, peaking near current strength on days one and two, before a gradual easing later in the UTC weekend and new working week, with predominantly quiet activity by this time.

Energetic Particles / Solar Radiation: Solar radiation storms are not expected in the period and levels of protons are most likely to remain at Background levels. There remains a daily slight chance of reaching the S1/Minor Storm level, mainly due to the large central sunspot region. This risk very slightly increases with time as the group moves westward on the Sun (to a better-connecting part of the Sun should appropriate flares arise).

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	25	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	50	50
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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